United States Patent [19]

Petersen

[11] **Patent Number: 4,871,992**

[45] **Date of Patent: Oct. 3, 1989**

[54] **TACTILE DISPLAY APPARATUS**

[76] Inventor: **Robert C. Petersen,** 37 Prospect Hill Rd., Noank, Conn. 06340

[21] Appl. No.: **216,880**

[22] Filed: **Jul. 8, 1988**

[51] **Int. Cl.**[4] **G08B 1/00;** G09B 21/00

[52] **U.S. Cl.** **340/407;** 340/825.19; 434/112; 434/113; 434/114

[58] **Field of Search** 340/407,711,712,825.19; 434/112-115

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,891,324	6/1959	Zuk .	
3,395,247	7/1968	Fieldgate .	
3,510,967	5/1970	King et al. .	
3,592,965	7/1971	Diaz .	
3,594,787	7/1971	Ickes .	
3,618,070	11/1971	Kagan .	
3,987,438	10/1976	Lindenmüeller .	
4,033,053	7/1977	Engler .	
4,044,350	8/1977	Tretiakoff et al. .	
4,178,586	12/1979	Schönherr .	
4,191,945	3/1980	Mannen et al. .	
4,194,190	3/1980	Bareau .	
4,215,490	8/1980	Fewell .	
4,266,936	5/1981	Rose et al. .	
4,445,871	5/1984	Becker .	
4,473,356	9/1984	Fernando et al. .	
4,488,146	12/1984	Burchart .	
4,586,903	5/1986	Burchart .	
4,586,904	5/1986	Chlumsky .	

Primary Examiner—Donnie L. Crosland

Attorney, Agent, or Firm—Albert W. Hilburger

[57] **ABSTRACT**

Apparatus for providing a tactile display according to which a touch pin is selectively movable relative to a reference surface. An electromagnet distant from the reference surface has spaced poles of opposite, selectively reversible, polarity. A cam rotatable about an axis transverse to the reference surface has an integral permanent magnet with similarly spaced poles of opposite polarity equidistant from the axis of rotation. The cam is rotatable between an active position at which its respective poles are attacted to and positioned adjacent the poles of the electromagnet and an inactive position at which the reversed poles of the permanent magnet are attracted to and positioned adjacent the opposite poles of the electromagnet. A touch pin has a longitudinal axis transverse to the reference surface and includes a follower end engageable with the cam and a tip end distant from the follower end. The pin is movable on the cam between a first position raised above the reference surface when the cam is in the active position and a second position not projecting beyond the reference surface when the cam is in the inactive position. A plurality of touch pins and associated mechanisms can be combined into a matrix to form a tactile display unit and a plurality of such units can be provided in a console and electrically driven in an intelligent fashion to provide the user with various forms of tactile information.

20 Claims, 4 Drawing Sheets